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Attorney Docket No. GEMS8081.218

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of : Polzin, Jason A.
Serial No. : 10/711,603
Filed : September 28, 2004
For : METHOD AND SYSTEM OF ENHANCING PHASE
SUPPRESSION FOR PHASE-CONTRAST MR IMAGING
Group Art No. : 2859
Examiner : Louis M. Arana

CERTIFICATION UNDER 37 CFR 1.8(a) and 1.10

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RENEWED
PETITION UNDER 37 C.F.R. §1.144 SEEKING
DIRECTOR REVIEW OF RESTRICTION REQUIREMENT

Dear Sir:

Responsive to the Office Communication mailed April 4, 2007, Applicant requests Director review and consideration of the following remarks in support of the rejoinder of claims 14-38 with claims 1-13.

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REMARKS

Applicant has filed three Petitions under 37 C.F.R. §1.144, each time receiving a reply from the Examiner or the Examiner's SPE. Such is not what is contemplated in MPEP §821.01 and in 37 C.F.R. §1.144 where, "[a]fter a final requirement for restriction, the applicant, in addition to making any reply due on the remainder of the action, may petition the Director to review the requirement." 37 C.F.R. §1.144. Applicant has paid for, and therefore requests, Director review of this Petition.

Claims 1-38 are pending in the present application. The Examiner withdrew claims 14-38. Claims 1-13 were allowed.

In a first Restriction Requirement issued February 6, 2006, the Examiner identified three alleged "species" in the pending application. After a proper election with traverse mailed March 8, 2006, Applicant twice sought Supervisory Review of the Restriction, in a first Petition mailed June 5, 2006, and a second Petition mailed September 11, 2006 (copies enclosed). However, in each case the Examiner pulled the Petition and unilaterally issued yet a new Restriction and twice has attempted to use an Ex parte Quayle Action in an attempt to unfairly force Applicant to cancel claims without proper review.

In the most recent restriction, that of the Ex parte Quayle action mailed November 3, 2006, the Examiner vacated the previous Restriction Requirement and issued yet another Restriction under 35 U.S.C. 121, alleged that the inventions are distinct, and issued a restriction to:

I. Claims 1-13, drawn to a system for determining the phase of stationary and flowing spins in a MRI image, classified in class 324, subclass 306

II. Claims 14-38, drawn to a method of phase correction in flow analysis MR imaging, classified in class 600, subclass 419.

Applicant responded January 3, 2007, and in that response Applicant elected, for a second time with traverse, the invention that the Examiner designated as invention I, drawn to claims 1-13. The Examiner responded with an Office Communication in which this most recent Restriction was made final. *Office Communication*, 04/04/2007, pg. 3.

Because of the history regarding restriction of this application, and Applicant's belief that the new Restriction is likewise wholly inappropriate, issuance of an Ex parte Quayle Action of November 3, 2006 and the subsequent Office Communication of April 4, 2007 is clearly improper.

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In issuing the new Restriction, the Examiner cited MPEP § 806.05(e) and stated that “the apparatus [of invention I] can be used to practice a materially different process such as, when the phase of moving and stationary spins is determined with other than the calculation of a power spectrum or pulsatility factor.” *Ex parte Quayle Action*, Nov. 3, 2006, Pgs. 2-3. However, MPEP § 806.05(e) also places the burden on the Examiner to “provide reasonable examples that recite material differences.” *MPEP § 806.05(e), Examiner Note*. The Examiner has not met the burden with regard to MPEP § 806.05(e), but merely attempted to use the claim language, and stated that the phase and moving stationary spins can be determined with other than the calculation of a power spectrum or pulsatility factor, yet provided no concrete examples outside the existing claim language.

Furthermore, in the Office Communication dated April 4, 2007, in making the restriction final, the Examiner addressed Applicant’s assertion that claim 1 is generic to claims 14 and 28. The Examiner cited MPEP § 806.04(d) and stated:

In the case at hand claim 1 requires the following material elements in addition to claims 14 and 28:

- 1) generation of more than one image
- 2) determination of phase associated with moving and stationary spins. *Office Communication*, 04/04/2007, Pg. 3.

The Examiner is in error with regard to the determination that claim 1 requires these two elements in addition to claims 14 and 28.

I. Claims 14 and 28, like claim 1, call for obtaining more than one image

Claim 14 calls for, in part, determining temporal frequency components for a given pixel of a phase-difference image, and including the pixel in a mask image. Likewise, claim 28 calls for, in part, instructions that when executed by a computer cause the computer to (A) determine a pulsatility factor for each pixel of a slice of a phase-difference image (B) generate a mask image, and (D) repeat (A)-(C) for each slice of the phase-difference image. In both claims, contrary to the allegation of the Examiner, generation of more than one image is called for. Accordingly, the Examiner’s allegation that claim 1 requires an element (namely, generation of more than one image) not present in claims 14 and 28 is not accurate.

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II. Determination of phase associated with moving and stationary spins, as called for in claim 1, is not an additional element to claims 14 and 28.

Claim 1 calls for, in part, a computer programmed to determine phase associated with flowing spins and phase associated with stationary spins. Such language is a generic way of calling for that which is called for in claims 14 and 28. Regarding the language of at least claim 14, para. 12 of the specification states:

An automated image processing technique is disclosed that evaluates the pixel phase from a PD image for contributions from flow and non-flow induced sources. From the temporal frequency components of each pixel, a power spectrum of the pixel is generated and evaluated. The power spectrum is evaluated to differentiate between pixels containing predominantly flow induced phase data and pixels containing predominantly background phase data. From this segmentation, the present invention provides a mask image that can be used to subtract background phase from the PD image. Subtraction can be carried out in each direction of flow and, in the context of cardiac or blood flow imaging, for each phase of a cardiac cycle. *Specification*, Para. 12 (emphasis added).

Furthermore, the claim language of claim 28 regarding pulsatility and its relation to the frequency power spectrum is described at least in Para. 31. In particular:

It is recognized that a number of approaches may be taken to determine or otherwise estimate flow pulsatility. In one approach, a temporal frequency power spectrum is used to determine pulsatility. In this regard, for a given pixel location within a PD image, if a given fraction of the signal is at a given energy level or within a given energy range, then the pixel is deemed to correspond to a region of pulsatile flow and is, therefore, excluded from a background phase fit. *Specification*, Para. 31 (emphasis added).

The above-cited paragraphs of the specification define the claim language of claims 1, 14, and 28 and their interrelationship. Claim 14 calls for, in part, determining temporal frequency components, generating a power spectrum, and including the pixel in a mask image if a given percentage of the power spectrum for the pixel is at a given energy. As stated in Para. 12, the mask image can be used to subtract background phase from a PD image. Likewise, claim 28 calls for, in part, determining a pulsatility factor for each pixel, generating a mask image, applying the mask image to the phase-difference image, and outputting a corrected phase-difference image with a substantial subtraction of background phase.

Thus, the “determination of phase associated with moving and stationary spins” of claim 1 is indeed called for in both claims 14 and 28 in alternate, more specific, language that is clearly laid out in the specification. Regarding claim 14, the mask image is used to subtract background

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phase from the PD image and such information is included if a percentage of the power spectrum for the pixel is at a given energy, thereby determining phase associated with moving and stationary spins. Likewise, regarding claim 28, the pulsatility factor called for is used to generate a mask image and output a corrected phase-difference image with substantial subtraction of background phase, thereby determining phase associated with moving and stationary spins.

Accordingly, the Examiner's statement that "determining phase associated with moving and stationary spins" is not present in claims 14 and 28 is in error.

Claim 1 is generic to claims 14 and 28

The apparatus of alleged invention I is generic to that which the Examiner has identified as invention II. MPEP § 806.04 states:

"[w]here an application includes claims directed to different embodiments or species that could fall within the scope of a generic claim, restriction between the species may be proper if the species are independent or distinct. However, 37 CFR 1.141 provides that an allowable generic claim may link a reasonable number of species embraced thereby. The practice is set forth in 37 CFR 1.146. *MPEP § 806.04 (emphasis added)*.

However, that called for in claims 14-38 is not "independent or distinct" from claim 1.

Claim 1 calls for, in part, a MRI system and a computer programmed to generate phase-difference images from a first acquisition and a second acquisition, determine a non-zero background phase from the phase-difference images that are due to eddy currents induced by flow encoding gradients used to generate the phase-difference images, remove the non-zero background phase from the phase-difference images, and determine phase associated with flowing spins and phase associated with stationary spins.

Independent claim 14 calls for a method of phase change correction in flow analysis MR imaging comprising the steps of determining temporal frequency components for a given pixel of a phase-difference image, generating a power spectrum of the given pixel from the temporal frequency components, determining percentage of the power spectrum within a given energy range, and including the pixel in a mask image if a given percentage of the power spectrum for the pixel is at a given energy.

Independent claim 28 calls for a computer readable storage medium having a computer program stored thereon and representing a set of instructions that when executed by a computer causes the computer to, (A) determine a pulsatility factor for each pixel of a slice of a phase-

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difference image, (B) generate a mask image of the slice from only those pixels having a given pulsatility factor, (C) apply the mask image to the phase-difference image for the slice to mask the phase-difference image along the slice, (D) repeat (A)-(C) for each slice of the phase-difference image, and (E) output a corrected phase-difference image with substantial subtraction of background phase.

The Examiner alleged that the claims are distinct. *Ex parte Quayle Action*, Nov. 3, 2006, Pg. 2. However, as clearly discussed above, the embodiments called for in claims 14 and 28 are not "independent and distinct" from that which is called for in claim 1 as the Examiner alleges. MPEP § 802.01 states:

Related inventions are distinct if the inventions *as claimed* are not connected in at least one of design, operation, or effect (e.g., can be made by, or used in, a materially different process) and wherein at least one invention is PATENTABLE (novel and nonobvious) over the other. *MPEP § 802.01*.

As discussed above, that called for in claim 1 is connected to claims 14 and 28 "in at least one of design, operation, or effect." As stated above, regarding claim 14, the mask image is used to subtract background phase from the PD image and such information is included if a percentage of the power spectrum for the pixel is at a given energy, thereby determining phase associated with moving and stationary spins. Likewise, regarding claim 28, the pulsatility factor called for is used to generate a mask image and output a corrected phase-difference image with substantial subtraction of background phase, thereby determining phase associated with moving and stationary spins. Thus, the "determination of phase associated with moving and stationary spins" of claim 1 is called for in both claims 14 and 28 in language that is clearly laid out in the specification, and that called for in claims 14 and 28 is not distinct from that of claim 1.

Furthermore, some of the dependent claims further indicate that claim 1 is generic to claims 14 and 28, and encompasses the scope of the material as called for in claims 14 and 28. Such is evident by that called for in some of the dependent claims of claim 1.

Claims 3 and 4, which depend from claim 1, call for calculation of a degree of pulsatility similar to that called for in claim 28. In claims 3 and 4 the computer is further programmed to, in part, determine the degree of pulsatility (claim 3) and exclude the object in the background image if the degree of pulsatility exceeds the pulsatility threshold (claim 4).

Claims 5-7, which depend from claim 1, call for calculation of a power spectrum similar to that called for in claim 14. In claims 5-7 the computer is further programmed to generate a mask from those objects not pulsating at a temporal frequency above a frequency threshold (claim

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5), wherein the frequency threshold is 0 Hertz (claim 6), and wherein a temporal frequency power spectrum is generated on a per pixel basis (claim 7).

Clearly the scope of material as called for in claims 14-38 falls within the purview of that called for in independent claim 1, thus making claim 1 generic to claims 14-38. Claim 1 is broad to the extent that it is properly narrowed by claims 3 and 4 by determining a degree of pulsatility. Claim 1 is broad to the extent that it is properly narrowed by claims 5-7 by determining a temporal frequency power spectrum on a per pixel basis. Accordingly, claims 14-38 are directed to "embodiments or species that could fall within the scope of a generic claim" and are not "independent and distinct" therefrom. According to MPEP § 806.04(d), "[o]nce a **>generic claim is allowable<**, all of the claims drawn to species in addition to the elected species which **>require<** all the limitations of the generic claim will ordinarily be *** allowable >over the prior art<** in view of the **>allowability<** of the generic claim, since the additional species will depend thereon or otherwise **>require<** all of the limitations thereof." *MPEP § 806.04(d)*. As such, because Applicant believes claim 1 is allowed and believed generic to the scope of material called for in claims 14-38, Applicant thereby requests rejoinder of claims 14-38 with claims 1-13 and requests allowance thereof.

In sum, the Examiner has not provided a valid basis for the new Restriction. The Examiner has not provided reasonable, concrete, examples that recite material differences to the apparatus as claimed. The present Restriction is improper because claim 1 is generic to the scope of material that is called for in claims 14-38.

For at least these reasons, Applicant respectfully requests that the Restriction be withdrawn. Accordingly, Applicant respectfully requests rejoinder of claims 1-38 and allowance thereof.

Applicant believes no fee is due for filing the Petition. However, should a fee be deemed necessary, Applicant hereby authorizes charging of Deposit Account No. 07-0845.

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Respectfully submitted,

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